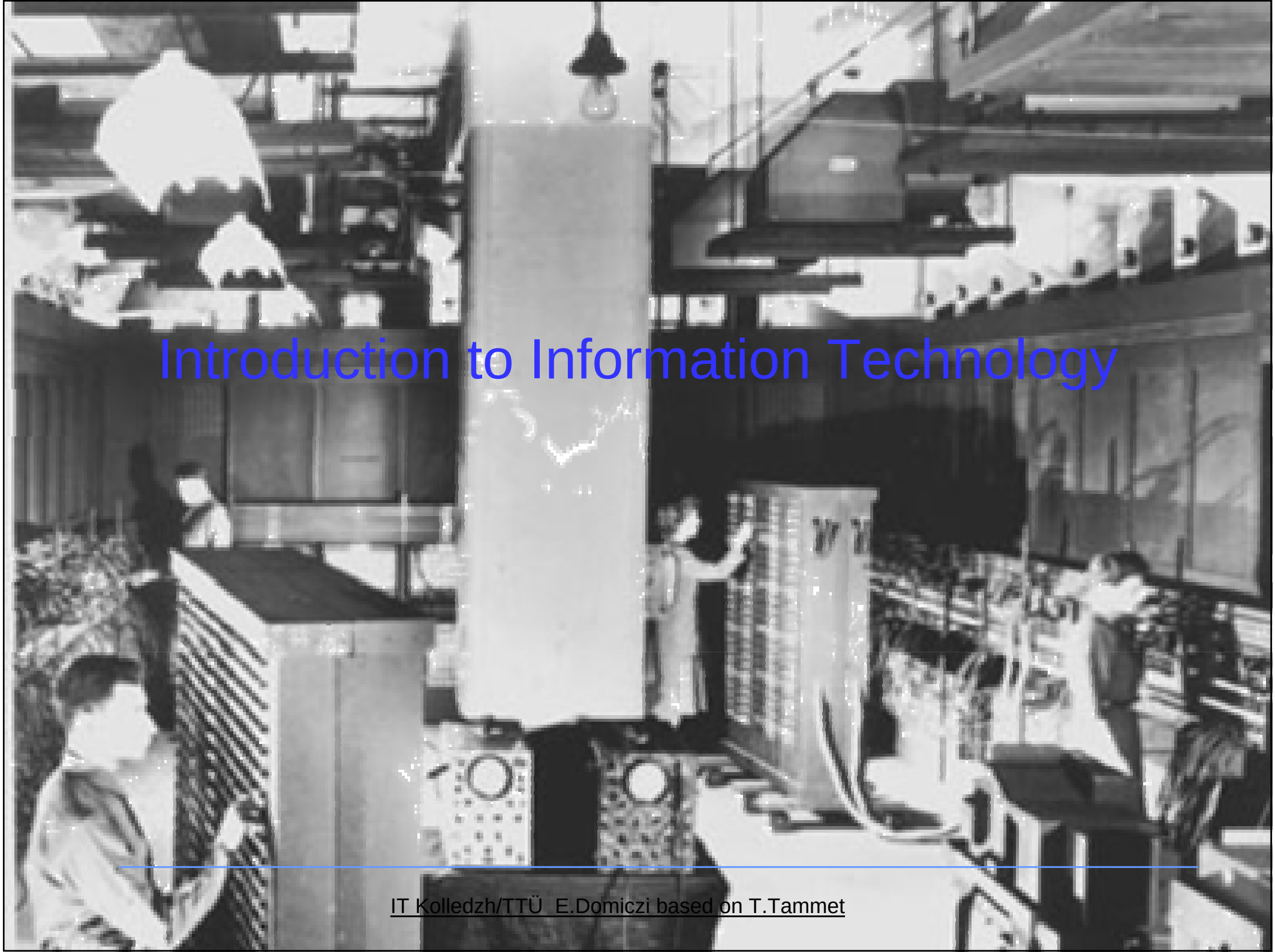


Introduction to Information Technology

Lecture overview

1967-1973: Minicomputers, processsors, network and freedom

- **Fast repetition: Birth of the Minicomputer**
- **Fast repetition: Integrated Circuits, processor companies**
- **First microcomputers**
- **Software of mini- and microcomputers: Unix, CP/M and programming languages**
- **Internet and Ethernet**

1974-1977: Birth of the Personal Computer

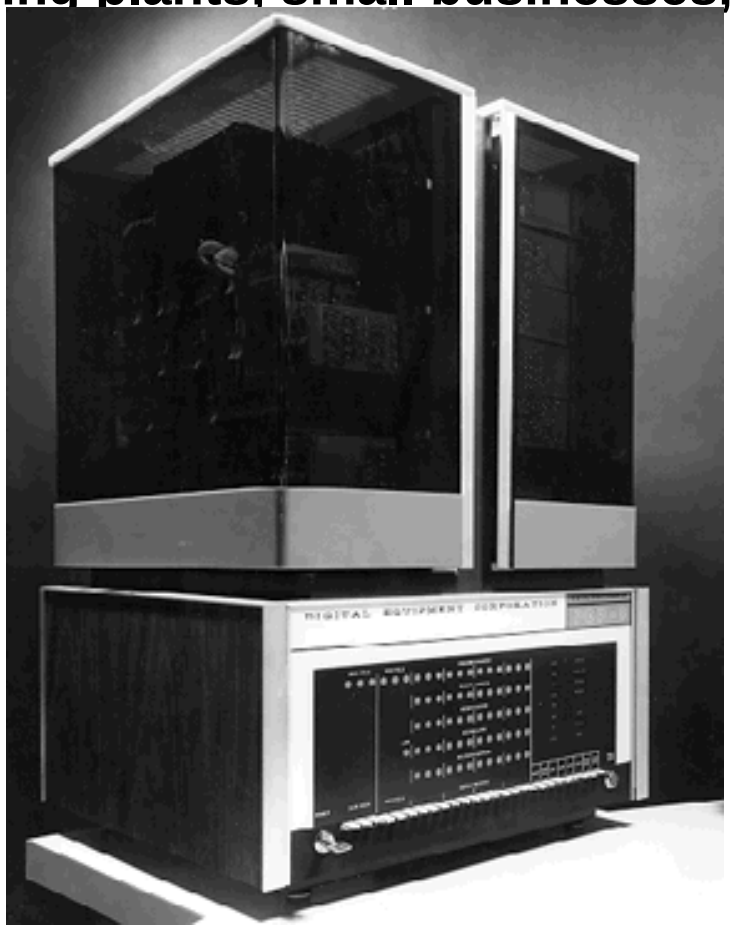
- **The first self-built microcomputers**
- **Club stuff**
- **Software: C, Basic**

1977-1980: Home computers

- **Commodore PET, Apple II, Radio Shack**
- **Apple**
- **Microsoft**
- **Software**
- **IBM PC first prototype**

1965

- **Digital Equipment Corp. introduced the** PDP-8**, the first commercially** successful minicomputer**. The PDP-8 sold for $18,000, one-fifth the price of a small IBM 360 mainframe. The speed, small size, and reasonable cost enabled the PDP-8 to go into thousands of manufacturing plants, small businesses, and scientific laboratories.**



1965 …1968

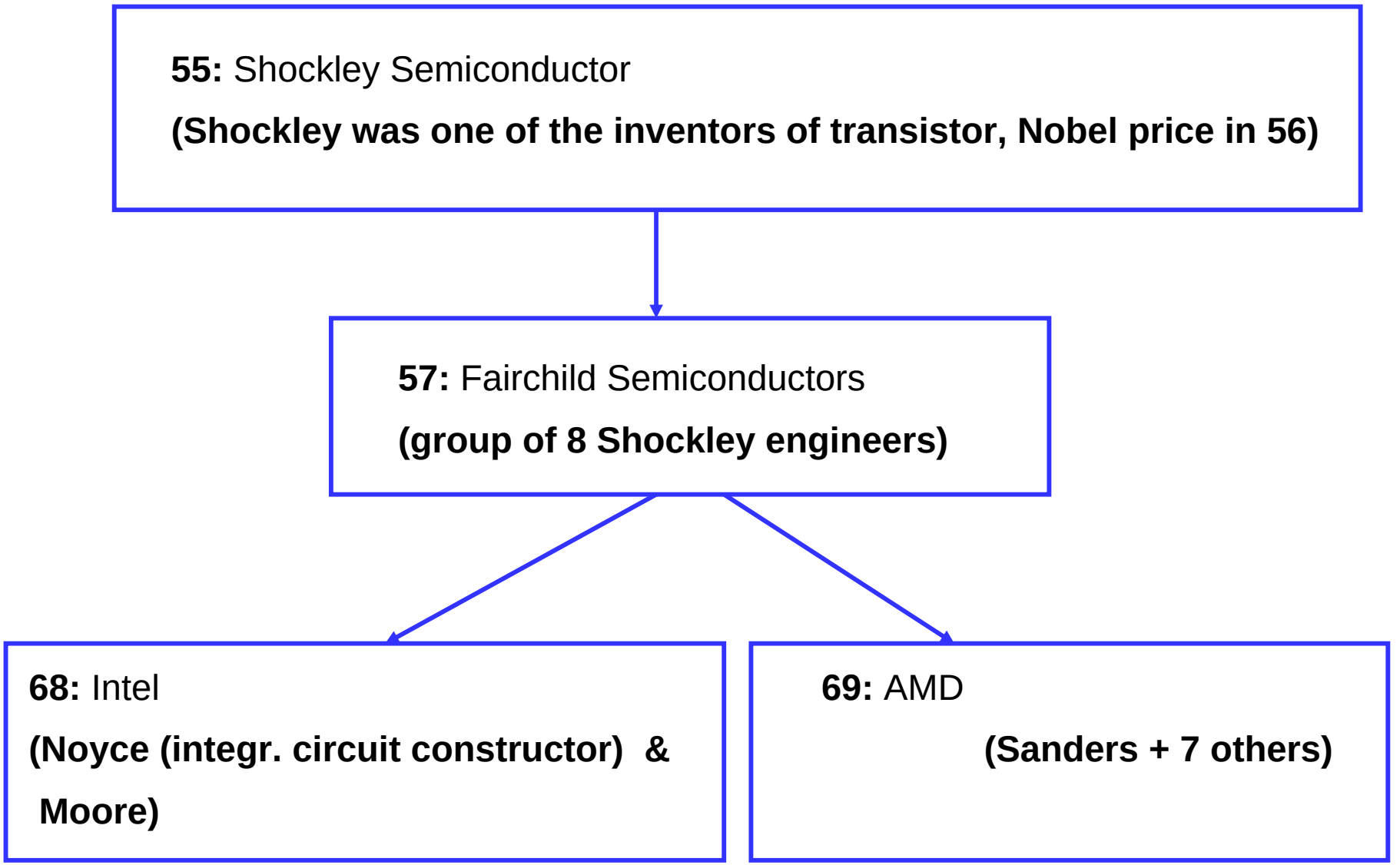
- Douglas C. Engelbart**, of the Stanford Research Institute, demonstrates his** system of keyboard, keypad, mouse, and windows **at the Joint Computer Conference in San Francisco's Civic Center. He demonstrates use of** a word processor, a hypertext system, and remote collaborative work with colleagues**.**

- **Robert Noyce and Gordon Moore leave Fairchild Semiconductors.**
- **Robert Noyce and Gordon Moore found** Intel Corporation**.**

State of the art: software and hardware

- In 1967 MacHACK VI became the first program to beat a human (rate 1510) at a competition**, at the Massachussets State Championship.**
- In 1968 International Master David Levy made a $3,000 bet that no chess computer would beat him in 10 years. He won his bet**. The original bet was with John McCarthy, a distinguished researcher in Artificial Intelligence**
- **Processors at 1968 were soldered together** from a large number of single transistors and a number of small chips containing relatively small amounts of transistors each

Recollect: Birth of Intel and AMD



1969

- **AT&T Bell Laboratories programmers Kenneth Thompson and Dennis Ritchie developed the** UNIX **operating system on a spare DEC minicomputer.**
- **Intel's Marcian (Ted) Hoff designs an integrated circuit chip that could receive instructions, and perform simple functions on data. The design becomes the** 4004 microprocessor**.**
- **Intel announces a** 1 KB RAM chip**, which has a significantly larger capacity than any previously produced memory chip.**
- Bill Gates and Paul Allen**, calling themselves the "Lakeside Programming Group" sign an agreement with Computer Center Corporation to report bugs in PDP-10 software, in exchange for computer time.**
- **Jerry Sanders and seven others leave Fairchild Semiconductor to form** Advanced Micro Devices**.**
- **Gary Starkweather, at Xerox's research facility in Webster, New York, demonstrates using a laser beam with the xerography process to create** a laser printer**.**

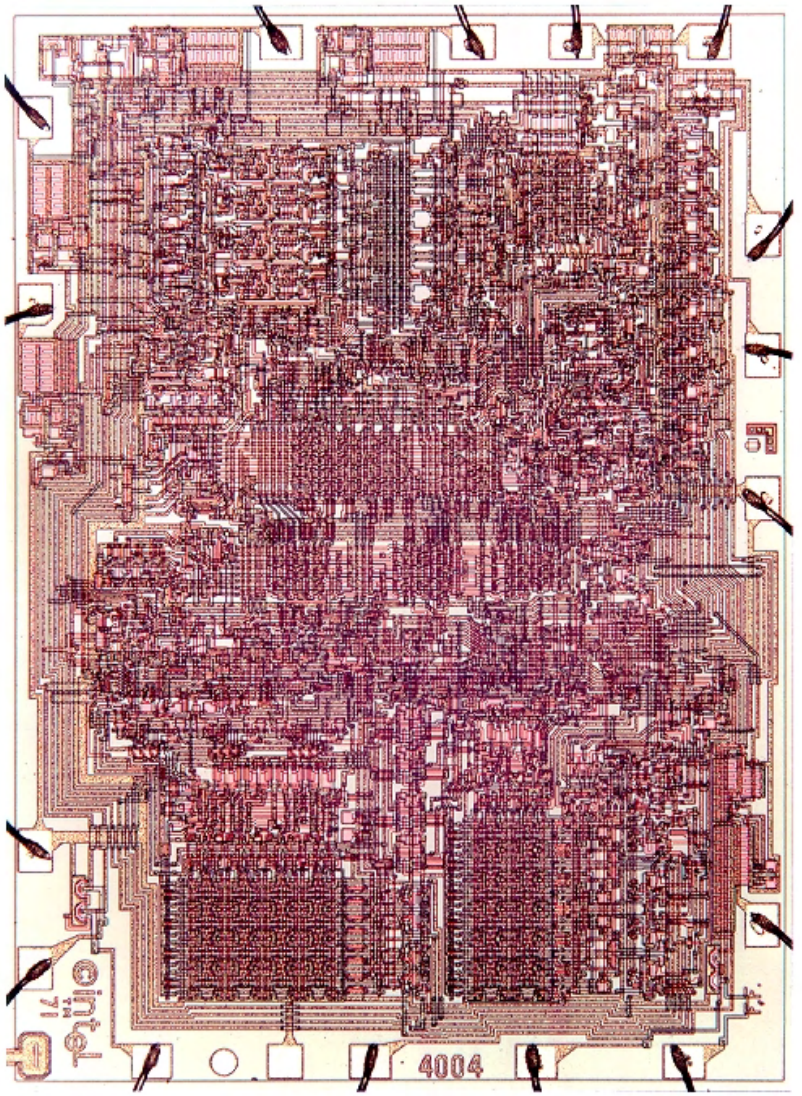
1970

- Xerox **opens the Palo Alto Research Center (**PARC**).**
- **Intel creates the 1103 chip,** the first generally available DRAM memory chip.
- Wayne Pickette takes his computer-on-a-chip design to Intel**, and is hired, began working for Dr. Ted Hoff.**
- **At Intel, Wayne Pickette proposes to Ted Hoff the idea of building a computer-on-a-chip for the Busicom project.**
- Gilbert Hyatt **files a patent application entitled "Single Chip Integrated Circuit Computer Architecture",** the first basic patent on the microprocessor.
- **Work begins at Intel on the layout of the circuit for what would be the 4004 microprocessor. Federico Faggin directs the work.**
- Intel creates the first 4004 microprocessor**.**

First microprocessor: Intel 4004

1969

The first microprocessor – CPU



1971

The first commercial 4-bit microprocessor 4004:

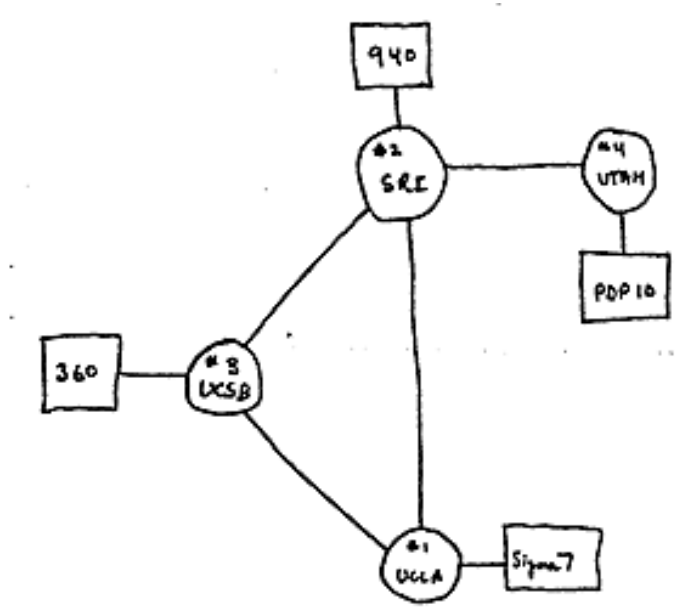
-2,300 transistors
-10 µm features
-10 mm² die
-108 kHz

…1970

- Relational database software: theory and first research groups
- **In 1970 an** IBM researcher named Ted Codd **published the first article on relational databases.**
- **Codd envisaged a system where the user would be able to access information with English like commands, and where information would be stored in tables.**
- **Due to the technical nature of the article, and the reliance on mathematics to support its case, the significance of it was not realized immediately. However, it did lead to IBM starting a** research group known as 'System R'.
- **Eventually** System R evolved into SQL**/DS which later became DB2. The language created by the System R group, SQL (Structured Query Language) has become the industry standard for relational databases and is now an ISO standard.**
- First commercial SQL database **created by Honeywell Information Systems Inc., which released a commercial product in June of** 1976**.**

1971…

- **Computer-to-computer Communication expanded when the Department of Defense established four nodes on the** ARPANET**: the University of California-Santa Barbara and UCLA, SRI International, and the University of Utah.**



…1971…

- **Intel ships copies of the 4004 microprocessor to Busicom. [556.10]**
- **Gary Boone, of Texas Instruments, files a patent application relating to a single-chip computer.**
- **The newly developed device, the** EPROM**, is integrated with the 4004 to Enhance Development Cycles of microprocessor product.**

- **Intel introduces its** 4-bit bus, 108-KHz 4004 chip - the first microprocessor**. Initial price is US$200. Speed is 60,000 operations per second. It uses 2300 transistors, based on 10-micron technology. It can address 640 bytes. Documentation manuals were written by Adam Osborne. The die for the chip measures 3x4 mm. The chip is introduced to the public in Las Vegas by Wayne Pickette.**

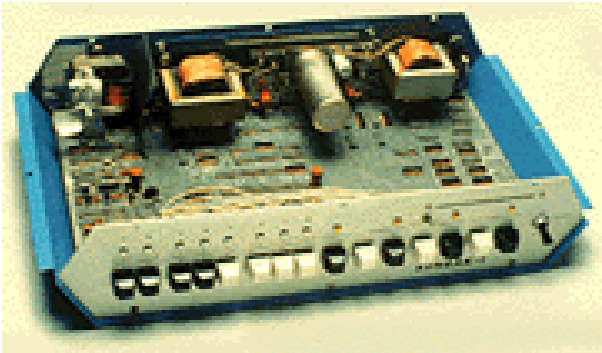
…1971…

- **Intel announces** the first microcomputer, the MCS-4 system**. It uses the 4004 microprocessor, 4001 ROM chip, 4002 RAM chip, and 4003 shift register chip.**
- **Electronic News publishes** an ad from Intel promoting the 4004 chip**.**
- **The National Radio Institute introduces** the first computer kit**, for US$503.**

- Steve Wozniak **and Bill Fernandez build a computer with lights and switches, from parts rejected by local companies. They call it the** Cream Soda Computer**.**

...1971

- **The Kenback Corporation introduces the** Kenback-1 **computer, for US$750. It uses a 1KB MOS memory made by Intel.**



- **Niklaus Wirth invents the** Pascal **programming language.**
- **Texas Instruments develops** the first microcomputer-on-a-chip**, containing over 15,000 transistors.**
- **IBM introduces the "memory disk", or "**floppy disk**", an 8-inch floppy plastic disk coated with iron oxide.**
- Wang Laboratories **introduces the Wang 1200 word processor system.**
- **Intel introduces the 1101 chip, a 256-bit programmable memory, and the 1701 chip, a 256-byte erasable read-only memory (EROM).**

1972…

- **Intel introduces its 200-KHz** 8008 chip, the first 8-bit microprocessor**. It accesses 16KB of memory. The processor was originally developed for Computer Terminal Corporation (later called Datapoint). It uses 3500 transistors, based on 10-micron technology. Speed is 60,000 instructions per second.**
- **Researchers at PARC begin work on a** prototype Alto **personal computer.**
- **At Xerox PARC, Alan Kay proposes they build a portable personal computer, called the** Dynabook**, the size of an ordinary notebook. PARC management does not support it.**
- **Texas Instruments introduces the** TMS1000 one-chip microcomputer**. It integrates 1KB ROM and 32 bytes of RAM with a simple 4-bit processor.**
- **National Semiconductor introduces the** IMP-16 microprocessor**.**

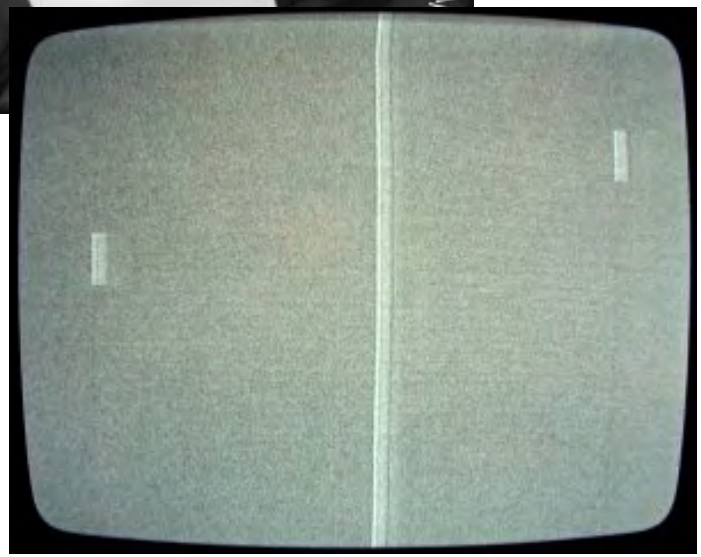
- Steve Wozniak **develops** “blue box” **to make** free phone calls **and sells the boxes to fellow students at UC Berkeley**

...1972...

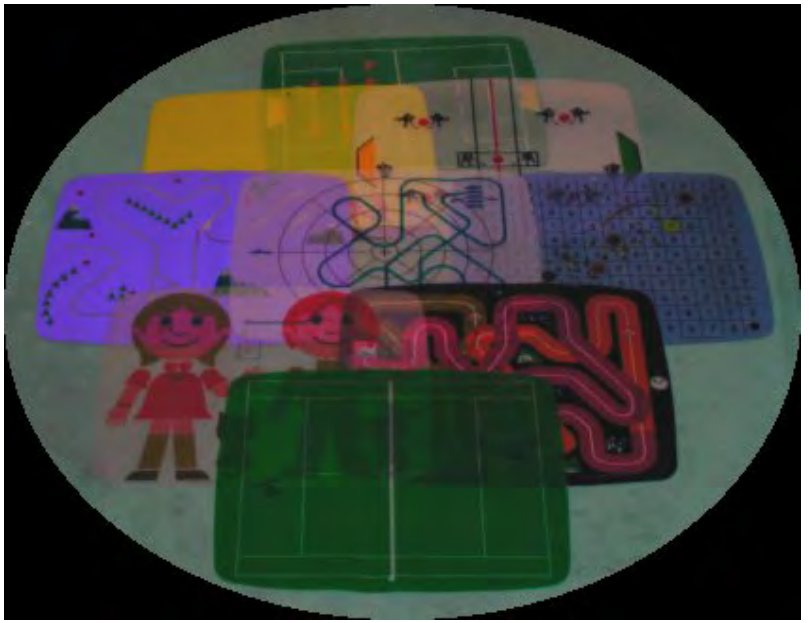
- Some gaming stuff:
  - **Space war** was a first graphical computer game, created on PDP-1 in 1961.
  - In 1970, an engineer called Ralph Baer created the game called *Computer Space* based on *Space War*.
  - Nolan Bushnell tried to make an arcade version of *Space War* and created *Computer Space*. Nutting Associates bought the game, hired Nolan and manufactured 1,500 *Space War* machines. The game was not a success because people found it difficult to play.
- As Nolan felt he didn't receive enough pay, he created his own company: Atari in 1972.
- Atari **ships** Pong**, one of the first really successful commercial video games.**
- In 1977 Atari enters the home computer market among others

…1972 ...

- Magnavox Odyssey: first home video game along with Atari



- **No processor: combined analog/digital**
- Plastic overlays on TV screen to get a background picture
- over 80,000 Odyssey and over 20,000 rifle packs sold in 1972
- Altogether, ca 350,000 made



1972: Colossal Cave: a text-based adventure game

- Written by Will Crowther**: Will worked on developing the assembly language program for the original routers used in creating the ARPAnet. In their spare time the Crowthers, both avid cavers, explored and mapped portions of the Mammoth and Flint Ridge cave systems in Kentucky for the Cave Research Foundation.**

- Crowther wrote a computer simulation based on the maps, for a Digital Equipment Corporation PDP-10 computer, in FORTRAN**. His first version included caver jargon, and many of the names of rooms in this version came from actual features in the caves Will had been exploring.**
- **Unfortunately,** it was during this period that Crowther's marriage ended. Feeling estranged from his two daughters and wanting to be closer to them, he decided to write a program that they might enjoy.
- **Crowther's daughters enjoyed the game, and** it was passed from friend to friend during the early days of the Internet**, appearing on countless computers on and off the fledgling network.**

What happened later with Colossal Cave

- In 1976, Don Woods **was working at Stanford University's Stanford Artificial Intelligence Lab, otherwise known by the acronym SAIL. Woods found a copy of Crowther's rudimentary program left on one of the SAIL computers by some unknown Johnny Appleseed, so to speak.**
- He contacted Crowther by the simple expedient of sending email to "crowther@*sitename*," where *sitename* was every computer then on the Internet, only a mere handful of sites at the time**. After corresponding with Crowther and getting his blessings, Woods greatly expanded the program.**
- **Influenced by Tolkien's writing,** Woods added touches such as a troll, elves, and a volcano.

- Jim Gillogly **at the Rand Corporation spent several weeks in 1976 porting the code (with Woods' and Crowther's blessings)** from the original FORTRAN source into C for UNIX**. Most UNIX systems run successors of this C version.** Gillogly later ported the code to Heathkit and then IBM-PC personal computers **with the help of Walt Bilofsky, founder of The Software Toolworks (which was eventually renamed Mindscape). This version was marketed in 1981 under the name "The Original Adventure."**

…1972

- **Canada's Automatic Electronic Systems introduces the world's** first programmable word processor with a video screen**, the AES 90. The computer system uses magnetic disks for storage, and a custom-built microprocessor.**
- Gary Kildall **implements** PL/I **on the Intel 4004 processor.**
- **The People's Computer Company is founded.**
- Bill Gates and Paul Allen **form the** Traf-O-Data **company.**
- **Traf-O-Data develops a primitive microcomputer based on Intel's 8008 microprocessor for recording automobile traffic flow on a highway.**
- 5 1/4 inch diskettes **first appear.**
- **Xerox decides to build a personal computer to be used for research.** Project "Alto" begins**.**

1972

- In 1971 Ray Tomlinson **of BBN** invents email program **to send messages across a distributed network.**

- **In 1972 Ray Tomlinson modifies** email program for ARPANET **where it becomes a quick hit. The @ sign was chosen from the punctuation keys on Tomlinson's Model 33 Teletype for its "at" meaning**

- First computer-to-computer chat takes place at UCLA**, and is repeated during ICCC, as psychotic PARRY (at Stanford) discusses its problems with the Doctor (at BBN)**

1972

- Two important programming concepts introduced:
  - **The first object-oriented language Smalltalk** developed at XEROX PARC, bsaed on ideas by Alana Kay.
  - **The first logic programming language Prolog** developed by Alan Colmerauer at University of Marseilles

1973…

- Intel files a patent application for a "memory system for a multichip digital computer".
- The first prototype Alto workstation computer is turned on at Xerox' Palo Alto Research Center. Its first screen display is a bitmapped image of the Sesame Street character Cookie Monster.
- The first operational Alto computer is completed at Xerox PARC.
- Traf-O-Data shuts down. It made about US$20,000.
- Design work is completed on the Micral, the first non-kit computer based on a microprocessor (the Intel 8008). Built in France, the Micral is advertised in the U.S., but is not successful there.
- The term "microcomputer" first appears in print, in reference to the Micral.

1972

- Hewlett-Packard introduces a programmable calculator **with a magnetic stripe memory for storing programs**
- **Users could write programs up to 100 lines in length and record them on blank cards, or they could buy pre-programmed cards.**
- **In 1975 it is used on Soyuz-Apollo mission for calculating critical course-correction maneuvers**

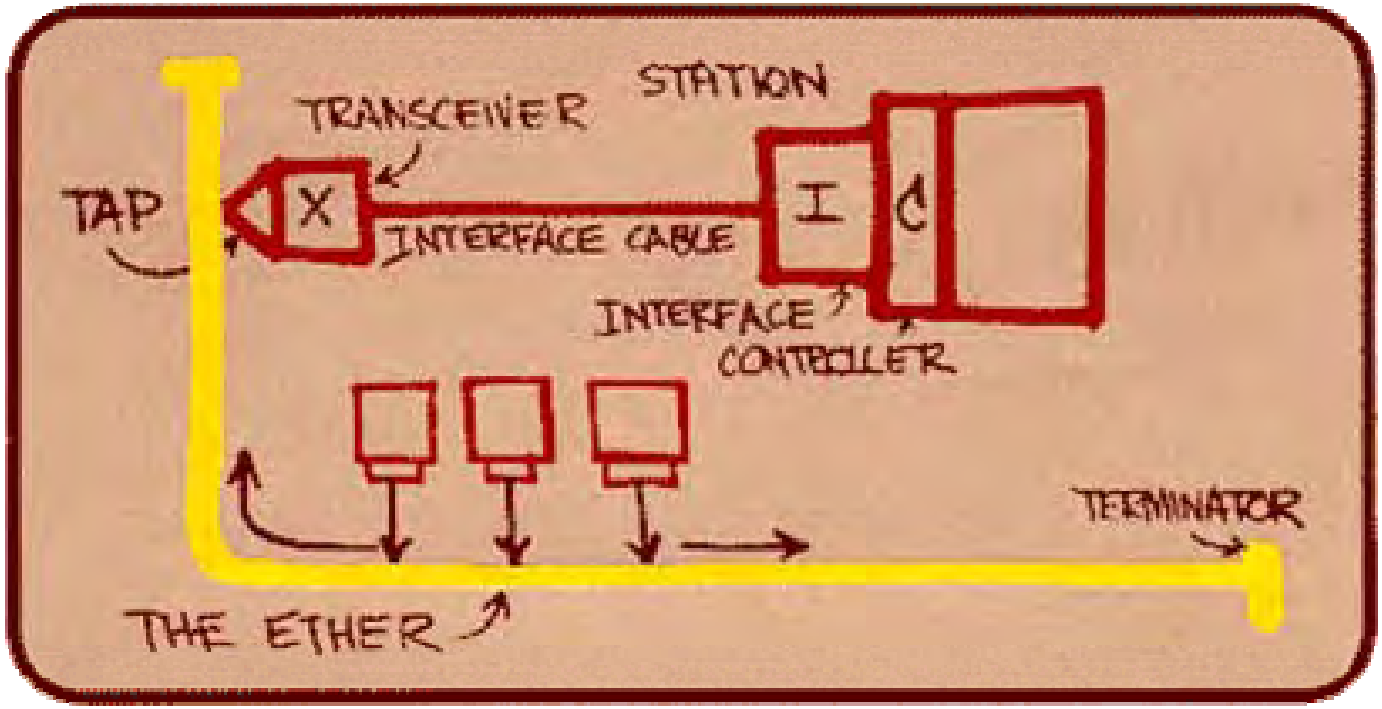
…1973…

- **Gary Kildall writes a simple operating system in his PL/M language. He calls it** CP/M **(Control Program/Monitor).**
- Stephen Wozniak **joins Hewlett-Packard.**
- **Gary Kildall creates PL/M for the Intel 8008, based on PL/I.**

- **IBM develops a cheap disk and drive.**
- **IBM introduces the IBM 3340 hard disk unit, known as the** Winchester**, IBM's internal development code name. The recording head rides on a layer of air 18 millionths of an inch thick. It uses four 8-inch diameter platters, giving it a capacity of 70 MB.**

…1973

- **Gary Kildall begins consulting work at Intel.**
- **Scelbi Computer Consulting Company offers** the first computer kit in the U.S. using a microprocessor**, the Intel 8008-based Scelbi-8H, for US$565, with 1KB programmable memory. An additional 15KB is available for US$2760.**
- Bob Metcalfe **invents the** Ethernet **connectivity system.**



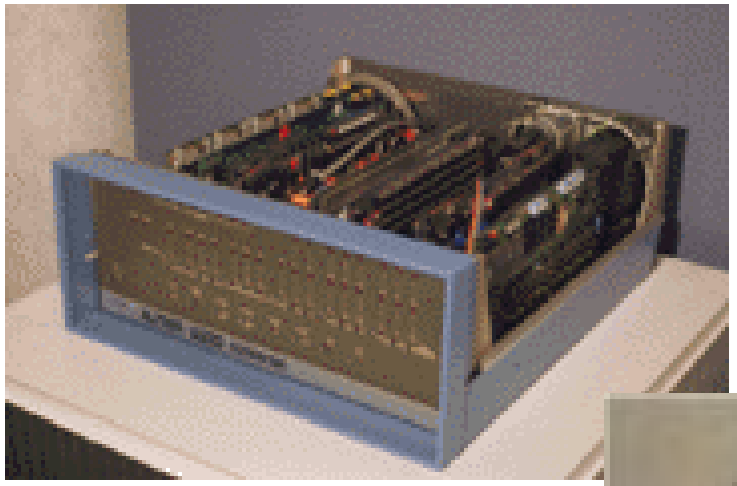
1974…

- **Intel releases its** 2-MHz 8080 chip, an 8-bit microprocessor**. It can access 64KB of memory. It uses 6000 transistors, based on 6-micron technology. Speed is 0.64 MIPS.**
- **In a desperate act to save his failing calculator company,** MITS **company owner Ed Roberts begins building a small computer based on Intel's new 8080 chip, with plans to sell it for the unheard-of price of US$500.**
- MITS **completes the first prototype** Altair 8800 microcomputer.

- **Bravo is developed for the Xerox Alto computer. It is** the first WYSIWYG program for a personal computer**.**

Altair

- **Altair was one of the first** successfully sold personal computer kits **for do-it-yourself computing fans. No monitor, no keyboard**



- Keyboard and cassette drive can be added
- Oscilloscope can be attached to be used as a display

…1974…

- **Railway Express loses Ed Robert's only prototype Altair computer, en route to New York for review and photography for publishing by Popular Electronics.**
- **Les Solomon, publisher of Popular Electronics, receives Altair number 0001.**
- **Lauren Solomon, 12 year old daughter of Les Solomon, publisher of Popular Electronics, suggests the name "**Altair**" for Ed Robert's new microcomputer. Altair was the name of where Star Trek's Enterprise was going that night on TV.**
- Popular Electronics publishes an article by MITS announcing the Altair 8800 computer for US$439 in kit form**. It uses the Intel 8080 processor. The Altair pictured on the cover of the magazine is actually a mock-up, as an actual computer was not available.**
- **Paul Allen sees the Popular Electronics issue with the Altair, and tells Bill Gates that the microcomputer revolution is just beginning.**

…1974

- **Gary Kildall, of Microcomputer Applications Associates, develops the** CP/M operating system for Intel 8080-based systems**.**
- Motorola **introduces its** 6800 chip**, an early 8-bit microprocessor used in microcomputers and industrial and automotive control devices. The 6800 was designed by Chuck Peddle and Charlie Melear.**
- **Brian Kernighan and Dennis Ritchie develop the** C programming language**.**
- **RCA releases the 1802 processor, running at a blazing 6.4 MHz. It is considered** one of the first RISC chips**. It is used on a variety of devices, from video games to NASA space probes.**
- **Engineer David Ahl suggests Digital Equipment produce an inexpensive version of its PDP-8 minicomputer, for US$5000. Top management call the idea foolish.**
- **Gary Kildall and John Torode begin selling the CP/M disk operating system for microcomputers.**

…1974: Alto

- Xerox releases the Alto computer.

- **A personal computer to be used for research**
- Cost: $32,000
- Never produced for profit
- **First serious machine to feature a modern user interface**: windows, mouse, etc invented by Engelbart in 1964
- Great influence on Macintosh
- Great influence on Microsoft

1975

- **Paul Allen meets with Ed Roberts to demonstrate the newly written BASIC interpreter for the Altair. Despite never having touched an Altair before, the BASIC works flawlessly.**

- Bill Gates and Paul Allen license their newly written BASIC to MITS**, their first customer. This is the first computer language program written for a personal computer.**

- **The** Xerox PARC**-developed Gypsy word-processing system is first field-tested by end-users.** Gypsy is one of the first word processors termed "WYSIWYG"**, meaning what you see is what you get. Gypsy runs on the PARC-developed Alto personal computer.**

1975

- **Fred Moore and Gordon French hold the first meeting of a** new microcomputer hobbyist's club **in French's garage, in Menlo Park, California. 32 people meet, including Bob Albrect, Steve Dompier, Lee Felsenstein, Bob Marsh, Tom Pittman, Marty Spergel, Alan Baum, and** Steven Wozniak**. Bob Albrect shows off an Altair, and Steve Dompier reports on MITS, and how they had 4000 orders for the Altair.**

- **Stephen Dorsey, founder of Automatic Electronic Systems, sells his 25% of the company for $135,000.**

- **The second meeting of Fred Moore/Gordon French's computer hobbyists group is held at the Stanford AI lab. 40 attend. The name for the group is chosen: Bay Area Amateur Computer Users Group -** Homebrew Computer Club**.**

1975

- **Bill Gates and Paul Allen found** Micro-Soft **(the hyphen is later dropped).**
- **MITS delivers the first generally-available** Altair 8800, sold for US$375 **with 1KB memory.**
- **MOS Technology announces the MC6501 at US$20 and the** MC6502 at US$25**. At this point, the Intel 8080 costs about US$150.**
- **Bob Marsh delivers the first Processor Technology 4KB memory boards for the Altair.**
- **At Xerox, John Ellenby proposes they build the** Alto II**, a modified Alto, making it easier to produce, more reliable, and more easily maintained. His request is approved.**
- **Bill Gates and Paul Allen sign** a licensing agreement with MITS**, for their implementation of the BASIC language.**
- **Bill Gates and Paul Allen ship 4K and 8K version of** BASIC v2.0**.**
- **Dick Heiser opens Arrow Head Computer Company, subtitled "The Computer Store", in Los Angeles, selling assembled Altairs, boards, peripherals, and magazines.** This is the first retail computer store in the USA**.**

1975

- **Micom Data Systems ships its first product, the Micom 2000 word processing computer.**
- **(summer) IMSAI announces the** IMSAI 8080 **microcomputer.**
- **IBM's Entry Level Systems unit unveils** "Project Mercury"**, the IBM 5100 Portable Computer. It is a briefcase-size minicomputer with BASIC, 16KB RAM, tape storage, and built-in 5-inch screen. Price: US$9000. Weight: 55 pounds. (Price over US$10,000)**
- **The first issue of** Byte **magazine is published.**
- **MITS releases a version of** MicroSoft BASIC 2.0 **for its Altair 8800, in 4K and 8K editions.**
- **Paul Terrell opens the Byte Shop, in Mountain View, California, one of the first computer stores in the US.**
- **Bill Gates writes** an open letter **to microcomputer hobbyists, complaining about software piracy, to be published in an Altair newsletter.**
- **Lee Felsenstein and Bob Marsh** begin work on a complete computer**, 8080-based with a keyboard and color video display capabilities built-in.**

1975

- **To date, MITS has sold** 2,000 Altair 8800 **systems.**
- **Wavemate releases the Jupiter II computer kit.**
- **Southwest Technical Products releases the M6800 computer kit.**
- **Canadian microchip maker Microsystems International shuts down, after accumulating losses of over $50 million.**
- **IBM's John Cocke begins work on project "801", to develop a scaleable chip design that could be used in small computers as well as large.**
- Zilog **is founded.**
- **MITS begins work on a Motorola 6800-based Altair.**
- **MITS sales of Altair computers hits** US$1 million**.**
- **Sphere Corporation introduces its Sphere I computer kit, featuring a Motorola 6800 CPU, 4KB RAM, ROM monitor, keyboard, and video interface, for US$650.**
- **Cromemco is founded, by Harry Garland and Roger Melen. The company is named after the Crowthers Memorial dorm at Stanford.**

1976

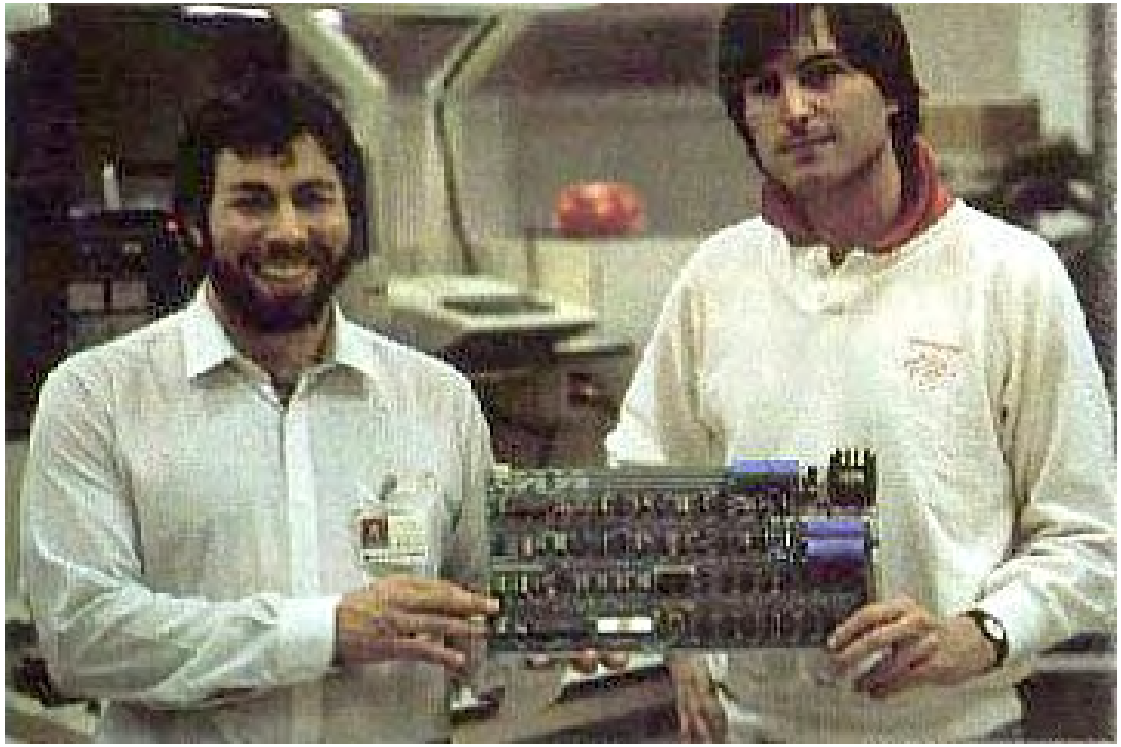
- **Paul Terrell begins signing dealership agreements, allowing Byte Shop franchises to open elsewhere in the US.**
- **David Bunnell publishes in his Altair newsletter an open letter from Bill Gates to the microcomputer hobbyists, complaining of software piracy.**
- **Bill Gates writes software routines for BASIC on the** Altair to use diskettes **for storage.**
- **Steve Wozniak and Steve Jobs finish work on a computer circuit board, that they call the** Apple I **computer**
- **By the end of its first year in business, Micom Data Systems ships 180 Micom 2000 computers, worth $2 million.**
- **Paul Terrell incorporates** Byte, Inc
- **Intel introduces the 5-MHz** 8085 microprocessor**. Speed is 0.37 MIPS. It uses 6500 transistors, based on 3-micron technology. It supports an 8-bit bus. Operates on a single 5-volt power supply. [62] (1978 [120])**
- **Bill Gates writes a** second open letter **to computer hobbyists, condemning software piracy. Again it is published in the Altair newsletter. [346.32]**
- **Microsoft hires its** first employee**, Marc McDonald. [346.34]**

1976

- National Semiconductor **releases the SC/MP 8-bit microprocessor, providing early advanced multiprocessing.**
- Digital Research copyrights CP/M**, its industry-standard microcomputer operating system, created by company founder Gary Kildall.**
- **Texas Instruments introduces the TMS9900,** the first 16-bit microprocessor**. The microprocessor implemented Texas Instrument's 16-bit architecture on the TI 990 minicomputer.**
- Wang Laboratories **announces a word-processing system using advanced computer technology, rather than traditional electromechanical devices. The price is** US$30,000**, more than twice that of the most expensive competitor's word-processor.**

1976

- Steve Jobs and Steve Wozniak **form the** Apple Computer Company**, on April Fool's Day.**
- **The** Apple I computer board is sold in kit form**, and delivered to stores by Steve Jobs and Steve Wozniak. Price: US$666.66.**
- **Paul Terrell orders** 50 Apple computers **from Steve Jobs, for his Byte Shop.**



1976

- **Zilog releases the** 2.5-MHz Z80**, an 8-bit microprocessor whose instruction set is a superset of the Intel 8080.**
- **Micom Data Systems ships its first product, the Micom 2000 word processing computer.**
- **Paul Terrell receives his order for 50 Apple computers.**
- **iCOM advertises their "Frugal Floppy" in BYTE magazine, an** 8-inch floppy drive, selling for US$1200**.**
- **Several computer hobbyist clubs hold their first convention at the Personal Computing Festival, in Atlantic City, New Jersey.**
- **Steve Wozniak** begins work on the Apple II**.**
- Computer Shack **is incorporated. The name is later changed to ComputerLand, due to objections from Radio Shack. (ComputerLand is incorporated)**

1976

- **Commodore International buys MOS Technology.**
- Mike Markkula**, ex-marketing wizard at Intel, visits Steve Jobs' garage, to see the Apple computers.**
- Steve Wozniak decides to remain at Hewlett-Packard, but is soon convinced that he should leave and join Apple Computer permanently.
- **The tradename** "Microsoft" **is registered.**
- **ComputerLand opens a pilot store in Hayward, California, as a retail outlet and a training facility for franchise owners.**
- **Paul Allen resigns from MITS.**
- Paul Allen joins Microsoft full time
- Bill Gates drops out of Harvard**, to devote his full attention to Microsoft.**

1976

- **Don French and Steve Leininger are given official approval to develop and sell a** microcomputer for Radio Shack**.**
- **Steve Wozniak and Randy Wigginton demonstrate the** first prototype Apple II **at a Homebrew Computer Club meeting.**
- **To date, MITS has shipped over** 10,000 Altair 8800 kits**.**
- **Hewlett-Packard begins Project Capricorn, to build** a computer-like calculator**.**
- **At Xerox, the Display Word Processing Task Force recommends that Xerox produce an office information system like the Alto. Code name for the project is Janus.**
- **Advanced Micro Devices and Intel** sign a patent cross-license agreement**, giving Advanced Micro Devices the right to copy Intel's processor microcode and instruction codes.**

1976

- **Xerox management rejects two proposals to market the Alto computer.**
- **Fairchild introduces the Channel F, the** first programmable (via plug-in cartridges) home video game system**. Price: US$170**
- **At Xerox, John Ellenby proposes they build the Alto III, to be marketed as an advanced word processing system. The proposal is shelved.**
- **Processor Technology releases VDM, a video display module. It works on the Altair, IMSAI, Sol, Polymorphic computers, and any other with an S-100 bus.**
- **Dynalogic of Canada creates its own advanced microcomputer.**
- Gary Kildall founds Intergalactic Digital Research**.**
- **Gary Kildall grants a license to CP/M to GNAT Computers for US$90.**
- **Gary Kildall grants a license to CP/M to IMSAI for US$25,000.**
- **Kentucky Fried Computers is founded.**
- **Tom Snyder's "Tomorrow" TV show features the Sol computer, playing a game called "Target".**

1976

- **John Martin sells Bill Millard on the idea of a chain of computer stores. Bill promises John shares in the company in exchange for the idea. The chain later becomes ComputerLand.**
- U.S. Robotics **is founded, in Skokie, Illinois**
- **MOS Technology ships the** 6502 microprocessor**. The 6502 was developed by Chuck Peddle.**
- **MOS Technology Inc. announces the KIM-1 Microcomputer System, with 1-MHz 6502 CPU, 1KB RAM, 2KB ROM monitor, 23-key keypad, LED readout, cassette and serial interfaces, for US$245.**
- **Chuck Peddle designs the** Commodore PET**.**
- **MITS unveils the** Altair 680**, based on the Motorola 6800 microprocessor.**
- **Steve Wozniak proposes that Hewlett-Packard create a personal computer. Steve Jobs proposes the same to Atari.** Both are rejected**.**

1976

- Warner Communications buys Atari from Nolan Bushnell for US$26 million**.**
- **The first issue of Dr. Dobbs is published**
- **IMSAI begins shipping the IMSAI 8080.**
- **Polymorphic Systems introduces the Poly morphic 8800. It is the first microcomputer with an interface for a video monitor, a connection for a cassette tape recorder, and its basic operating system in ROM**
- Cray Research introduces the Cray-1 **vector-processing computer.**

- Bill Joy writes “vi”: a simple visual text editor for UNIX.
- **Vi is a follow-up to the line editors ed and em**
- Joy later became**:**
  - Main author of the Berkeley UNIX (BSD) version
  - One of the founders of Sun Microsystems
  - One the main authors of Java

1977-1980 : Home computers

Apple, Commodore, Radio Shack, Microsoft,
more microprocessors, VisiCalc, Sinclair

1977

- **The** Commodore PET **(Personal Electronic Transactor) -- the first of several personal computers released in 1977 -- came fully assembled and was straightforward to operate.**

1977

- **The** Apple II **became an instant success when released in 1977 with its printed circuit motherboard, switching power supply, keyboard, case assembly, manual, game paddles, A/C powercord, and cassette tape with the computer game "Breakout."**

1977

- **In the first month after its release,** Tandy Radio Shack's **first desktop computer -- the** TRS-80 **-- sold 10,000 units, well more than the company's projected sales of 3,000 units for one year.**

1977

- **The** Apple Computer Company **is incorporated.**
- **Apple employees move into an office on Stevens Creek Boulevard in Cupertino, California.**
- **A working model of the first Radio Shack computer is demonstrated to company president, Charles Tandy.**
- **Commodore first shows a prototype PET computer at the Winter Consumer Electronics Show.**
- **Apple Computer moves from Jobs' garage to an office in Cupertino.**
- **Bill Gates and Paul Allen sign a partnership agreement to officially create the** Microsoft **company.**

1977

- **Commodore Business Machines Inc. shows its PET 2001 computer at the West Coast Computer Faire. The PET includes a 6502 CPU, 4KB RAM, 14KB ROM, keyboard, display, and tape drive, for US$600.**
- **Apple Computer introduces the Apple II at the West Coast Computer Faire. The computer features a 6502 CPU, 4KB RAM, 16KB ROM, keyboard, 8-slot motherboard, game paddles, graphics/text interface to color display, and built-in BASIC, for US$1300. It is the first personal computer with color graphics**
- **Apple Computer delivers its first Apple II system.**

May

- **10 months after its introduction, 175 Apple I kits have sold.**
- Pertec buys MITS and the Altair line for US$6 million in stock**.**

July

- **Microsoft ships "Microsoft FORTRAN" for CP/M-based computers**

August

- **Radio Shack (a division of Tandy Corp.) announces the TRS-80 microcomputer, with Z80 CPU, 4KB RAM, 4KB ROM, keyboard, black-and-white video display, and tape cassette for US$600.**

1977

September

- **One month after launching the TRS-80, 10,000 are sold, despite sales projections of only 3,000 in the first year.**

November

Apple Computer releases Applesoft, a version of BASIC with floating-point capabilities. It is licensed from Microsoft

- **Heath Schlumber Company introduces its first microcomputer kit, the H-8 personal computer kit, based on the Intel 8080.**

December

- **At an executive board meeting at Apple Computer, president Mike Markkula lists the floppy disk drive as the company's top goal.**
- **Steve Wozniak writes the floppy disk controller software for use with the Apple II.**

1977

- **Dan Bricklin conceives the idea for the VisiCalc spreadsheet program.**
- **IMSAI licenses use of CP/M for its microcomputers for US$25,000.**
- **Atari introduces the Atari Video Computer System (VCS), later renamed the Atari 2600.**

1978

- The VAX 11/780 from Digital Equipment Corp**. featured the ability to address up to 4.3 gigabytes of virtual memory, providing hundreds of times the capacity of most minicomputers.**

- The 5 1/4-inch floppy disk **became the standard medium for personal computer software after Apple Computer and Tandy Radio Shack introduced disk drives for this format.**

1978

January

- Apple Computer demonstrates its first working prototype Apple II disk drive **at the Consumer Electronics Show, in Las Vegas.**

May

- **Intel begins production of the 8086 microprocessor. It is created by two engineers in just three weeks. Work on the processor began when it was realized that the i432 project was in trouble.**

June

- Intel introduces the 4.77-MHz 8086 microprocessor**. It uses 16-bit registers, a 16-bit data bus, and 29,000 transistors, using 3-micron technology. Price is US$360. It can access 1 MB of memory. Speed is 0.33 MIPS. Later speeds included 8-MHz (0.66 MIPS) and 10-MHz.**
- **Microsoft ships Microsoft COBOL.**
- **Apple Computer introduces the Disk II, a 5.25 inch floppy disk drive linked to the Apple II by cable. Price: US$495, including controller card.**
- Pertec ceases production of the Altair.

1978

August

- **MicroPro introduces WordMaster.**
- **Digital Equipment opens a retail store in a shopping mall, for selling small computer systems priced below US$10,000.**

December

- **Epson announces the MX-80 dot matrix printer, which established a new standard in high performance with low price for printers.**
- **Atari announces the Atari 400 and 800 personal computers, using the 6502 microprocessor.**
- Microsoft's sales for the year reach US$1 million.
- **(early) Dan Bricklin completes a BASIC program demonstrating his proposed spreadsheet application.**
- **(summer) Apple Computer hires Chuck Peddle, designer of the 6502 microprocessor and Commodore's PET.**
- **(fall) Personal Software company software publisher Dan Fylstra loans an Apple II to Dan Bricklin to create his spreadsheet program.**
- **(fall) Microsoft begins developing BASIC for the Intel 8086 processor.**

1978

- **Apple Computer begins work on a supercomputer with a bit-sliced architecture, code-named** Lisa**.**
- **Taito releases the Space Invaders game to arcade centers.**
- **Bally begins shipping its Bally Professional Arcade game.**
- **Cinematronics releases Space Wars to arcades.**
- **IBM scientist John Cocke produces the 801 computer, a RISC prototype named after the laboratory building it was built in.**
- **Tandy opens its first dedicated computer center.**
- **Apple Computer begins research and development on what would become the Lisa.**
- **Xerox donates 50 Alto computers to Stanford, Carnegie-Mellon, and MIT.**
- **Hermann Hauser founds Acorn Computers, in England.**

1979

- **Harvard MBA candidate Daniel Bricklin and programmer Robert Frankston developed VisiCalc, the program that made a business machine of the personal computer, for the Apple II.**

1979

- **The Motorola 68000 microprocessor exhibited a processing speed far greater than its contemporaries.**
- **In development since 1967, the Stanford Cart successfully crossed a chair-filled room without human intervention in 1979.**
- **California Institute of Technology professor Carver Mead and Xerox Corp. computer scientist Lynn Conway wrote a manual of chip design, "Introduction to VLSI Systems."**

January

- **Xerox president replies to John Ellenby's proposal to market the Alto, turning down his proposal.**
- **Microsoft moves its offices from Albuquerque, New Mexico to Bellevue, Washington.**
- **Taito first shows the Space Invaders game, in Japan.**

May

- **Software Arts demonstrates VisiCalc at the 4th West Coast Computer Faire. Dan Bricklin and Bob Frankston wrote it during 1978-79, under the company name Software Arts, under contract to Personal Software.**

1979

June

- **Apple Computer introduces the** Apple II Plus**, with 48KB memory, for US$1195.**
- **Apple Computer introduces its first printer, the Apple Silentype, for US$600. It is a Trendcom Model 200, released under the Apple name.**
- **Intel introduces the** 4.77-MHz 8088 microprocessor**. It was created as a stepping stone to the 8086, as it operates on 16 bits internally, but supports an 8-bit data bus, to use existing 8-bit device-controlling chips. It contains 29,000 transistors, using 3-micron technology, and can address 1MB of memory. Speed is 0.33 MIPS. A later version operates at 8-MHz, for a speed of 0.75 MIPS.**
- **Bob Metcalfe founds** 3Com **Corporation.**
- **Texas Instruments introduces the TI-99/4 personal computer, for an initial price of US$1500. It uses the TI 9940 16-bit microprocessor.**
- **MicroPro releases the** WordStar **word processor, written by Rob Barnaby. It is made available for Intel 8080A Zilog Z-80 based CP/M-80 systems. written by Seymour Rubenstein**
- **Microsoft announces Microsoft BASIC 8086 at the National Computer Conference.]**

1979

July

- **CompuServe begins a service to computer hobbyists called MicroNET, offering bulletin boards, databases, and games.**
- **Clive Sinclair creates Sinclair Research.**

August

- **Microsoft releases its Assembler language for 8080/Z80 microprocessors.**
- **Wayne Ratliff develops the Vulcan database program (Ashton- Tate later markets it as** dBase II**).**

September

- Motorola's 68000 16-bit microprocessor appears**. It uses 68,000 transistors, giving it its name.**

October

- **2.5 years after the introduction of the Apple II, 50,000 units have been sold.**
- **Personal Software releases VisiCalc for the Apple II, for US$100.**

1979

- **Atari begins shipping the Atari 400 and Atari 800 personal computers. The 400 comes with 8KB, selling for US$550. The 800 sells for US$1000.**
- **Radio Shack begins shipping the TRS-80 Model II to users.**

November

- **Xerox Office Products Division president, Don Massaro, decides to champion the Star office system (based on the Alto).**
- **Texas Instruments begins shipping the TI 99/4.**

December

- A group of Apple Computer engineers and executives is given a demo of Xerox Palo Alto Research Center's Alto computer system, in exchange for Xerox buying 100,000 Apple Computer shares for US$1 million.
- **Atari develops the Asteroids computer game.**
- **Microsoft completes work on BASIC for the Intel 8086 processor.**
- **The first Comdex show is held, in Las Vegas. Approximately 150 companies show products to some 4,000 visitors.**

1979

- **Microsoft begins developing an 8086 version of FORTRAN. [346.72]**
- **Apple Computer's Trip Hawkins negotiates a deal with Dan Fylstra of Personal Software to buy his company and VisiCalc for US$1 million in Apple stock. Apple's president refuses to approve the deal.**
- Ross Perot **asks Bill Gates about buying Microsoft. Gates recalls asking US$6-15 million. Perot recalls Gates asking US$40-60 million.**
- **Alan Shugart founds Seagate Technologies (hard disk maker), in Scotts Valley,**
- **Apple Computer begins work on "Sara", the code name for what will be the Apple III.**
- **Apple Computer releases the word processing program AppleWriter 1.0.**
- **Michael Shane founds Leading Edge Products.**
- **Schlumberger Ltd. sells Heath Company to Zenith Radio Corp. for US$64.5 million.**
- **Automated Simulations releases** Temple of Apshai **for microcomputers.**
- **Niklaus Wirth invents the** Modula-1 **programming language.**
- **NEC releases its NEC PC 8001 microcomputer in Japan, the first for that country. [346.55]**
-

1979

- Xerox shows its Alto personal computer in TV commercials.
- After airing a TV commercial for the Alto several times, Xerox decides not to market the Alto.

79-80: USENET : early “web” : text(-based) news

- **USENET is a huge amount of newsgroups. Text moves from machine to machine.**
- USENET**: Unix Users Network founded** late 1979.
- **Info transfer initially: through** UUCP **(Unix to Unix communications protocol, mostly with modem help (dialing-in).**
- **1979: released** V7 Unix with UUCP**. Two Duke University grad students in North Carolina, Tom Truscott and Jim Ellis, thought of hooking computers together to exchange information with the Unix community. Steve Bellovin, a grad student at the University of North Carolina, put together the first version of the news software using shell scripts and installed it on the first two sites: "unc" and "duke." At the beginning of 1980 the network consisted of those two sites and "phs" (another machine at Duke), and was described at the January Usenix conference.**
- 1986 breakthrough**: Network News Transfer Protocol (**NNTP**) . News move via TCP/IP (internet).**

1980

MAIN HIGHLIHTS

- Symbolics **founded.**
- Seagate Technology **created** the first hard disk drive for microcomputers**. The disk held 5 megabytes of data, five times as much as a standard floppy disk, and fit in the space of a floppy disk drive.**
- The first optical data storage disk **had 60 times the capacity of a 5 1/4-inch floppy disk.**
- **John Shoch at the** Xerox Palo Alto Research Center invented the computer "worm," **a short program that searched a network for idle processors**

Specialprocessors: birth 1980, death ca 1990

- Symbolics founded 1980. **Created special hardware for running LISP programs (mostly AI) efficiently.The whole system written in LISP.**
- **21 founders: mostly from** MIT AI lab**.**
- **Revenue 35 millions by 1986, then decreases rapidly.**
- **Cost of a Symbolics machine in 1988 was between 36.000$ and 125.000$.**
- **Sun-X computer at that time**

started at 14.000$

- **Another Lisp machine company created**

at the same time: LMI LISP machine

died even faster than Symbolics

1980

January

- **Universal Data Systems announces the 103LP 300 bps modem, connecting directly into the phone line, requiring no additional power. Price: US$195.**
- **Sinclair Research announces the ZX80 computer in the North American market. It uses a 3.25-MHz NEC Technologies 780-1 8-bit microprocessor, and comes with 1KB RAM and 4KB ROM.**

March

- **Microsoft Corp. announces its first hardware product, the Z-80 SoftCard for the Apple II. This card gives the Apple II CP/M capability, contributing greatly to Apple Computer's success. The card includes CP/M and Microsoft's Disk BASIC, all for US$349.**
- **Satellite Software International ships WordPerfect 1.0 for Data General minicomputers.**

May

- **Apple Computer introduces the Apple III at the National Computer Conference, in Anaheim, California. The Apple III uses a 2-MHz 6502A microprocessor, and includes a 5.25-inch floppy drive. Price ranges from US$4500 to US$8000.**

1980

- **IBM's Corporate Management Committee gives William Lowe approval to begin Project Chess, by recruiting 12 engineers, and building** a prototype microcomputer.
- **IBM representatives meet with Microsoft's Bill Gates and Steve Ballmer to talk about Microsoft products, and home computers.**
- **IBM asks Bill Gates to write the operating system for their upcoming PC.**
- **IBM's Project Chess task force contacts Digital Research about using CP/M-86 for IBM's upcoming microcomputer. Gary Kildall is not interested, for a variety of reasons.**

August

- **IBM meets with Microsoft again, and shows plans for Project Chess, a personal computer. The code name for the computer is "Acorn". Bill Gates argues that IBM should use the 16-bit 8086, rather than the 8-bit 8080 processor.**
- **QDOS 0.10 (Quick and Dirty Operating System) is shipped by Seattle Computer Products. Even though it had been created in only two man-months, the DOS worked surprisingly well. A week later, the EDLIN line editor was created. EDLIN was supposed to last only six months, before being replaced.**

1980

- **Hal Lashlee and George Tate form Software Plus. The company later changes its name to Ashton-Tate.**
- **Microsoft announces the Microsoft XENIX OS, a portable and commercial version of the UNIX operating system for the Intel 8086, Zilog Z8000, Motorola M68000, and Digital Equipment PDP-11.**

September

- **Microsoft decides to propose to IBM that they provide the operating system for IBM's microcomputer.**
- **William Lowe assembles the members of "Project Chess", known as the "Dirty Dozen", the 12 engineers assembled to design and build the IBM PC, in Boca Raton, Florida.**
- **Apple Computer sells over 78,000 Apple II computers during the fiscal year.**
- **Software Publishing ships the pfs:File database program.**
- **IBM meets with Microsoft again, to formalize plans to work together in creating a new microcomputer.**

1980

October

- **Microsoft's Paul Allen contacts Seattle Computer Products' Tim Patterson, asking for the rights to sell SCP's DOS to an unnamed client (IBM). Microsoft pays less than US$100,000 for the right.**
- **Bill Gates, Paul Allen, and Steve Ballmer meet with IBM in Boca Raton, Florida, to deliver a report to IBM. They propose that Microsoft be put in charge of the entire software development process for IBM's new microcomputer, including converting Seattle Computer Products' SCP-DOS to run on the computer.**

November

- **Microsoft and IBM sign a contract for Microsoft to develop certain software products for IBM's microcomputer.**

December

- **IBM delivers the first PC prototype to Microsoft, so they can begin developing BASIC and the machine's operating system.**
- **Apple Computer becomes a publicly held company, selling 4.6 million shares at US$22 per share. More than 40 Apple employees and investors become instant millionaires.**

1980

- **Seattle Computer Products renames QDOS to 86-DOS, releasing it as version 0.3. Microsoft then bought non-exclusive rights to market 86-DOS.**
- **Logo Computer Systems is formed in Montreal, Canada, to market the public domain language LOGO.**
- **Microsoft begins work on its first microcomputer application, a spreadsheet program initially called Electronic Paper.**
- **Digital Research releases** CP/M-86 **for Intel 8086- and 8088-based systems.**
- **Intel announces the iAPX-432 32-bit microprocessor. Intel later builds the 80286 as a step between the 8086 and the 432.**
- **The term RISC (reduced instruction set computer) is coined by Professor David Patterson of the University of California in Berkeley. He designs a microprocessor called RISC I.**
- **Intel introduces the** 8087 math coprocessor**.**
- **Alan Ashton and Bruce Bastian found Satellite Software International.**
- Apollo **introduces a line of workstations using the Motorola 68000.**